LIBRARY
RECEIVED
FEB 26 1937
U. S. Department of Agriculture

THE PLANT DISEASE REPORTER

Issued By

· Division of Mycology and Disease Survey

Volume XXI Number 3

February 15, 1937.

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

THE PLANT DISEASE REPORTER

Issued by

THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Vol. XXI Number 3

February 15, 1937.

IN THIS ISSUE

The early appearance of tobacco downy mildew in Georgia this year is reported by J. G. Gaines, page 42.

Dates of first observation of tobacco downy mildew in past years are listed, page 42.

Luther Shaw has compiled a report on tobacco diseases in 1936, page 44.

B. F. Dana reports on the occurrence of curly top in the Pacific Northwest in 1936, page 50.

Ascochyta lycopersici is reported as causing leaf spot of potato in Oregon, by F. D. Bailey and Roderick Sprague, page 54. The only other report in the Survey files of this fungus on potato in this country is from Alaska.

Leaf rusts are unusually prevalent for this time of year on oats and wheat in Georgia according to H. W. Rankin, page 55.

Hosts and distribution of Cytospora canker of spruce are listed briefly by Alma M. Waterman, page 55.

Malcolm A. McKenzie reports the results of a survey for shade tree diseases in Massachusetts, page 55.

The distribution of Cephalosporium and Verticillium on elm in Massachusetts is reported by Eunice M. Johnson, page 58.

Winter injury in Idaho following the severe winter of 1935-1936 is reported in four notes: Winter injury to tree and small fruits, by W. C. Blodgett, page 60; Effects of the autumn 1935 cold wave on forest trees in northern Idaho, by R. K. Pierson and John Ehrlich, page 64; Effect of early frosts on Pinus monticola in northern Idaho in 1935, by the same authors, page 65; Effects of the autumn 1935 cold wave on ornamentals in northern Idaho, page 66.

January weather, page 66.

EARLY APPEARANCE OF TOBACCO DOWNY MILDEW IN GEORGIA IN 1937

J. G. Gaines

Tobacco downy mildew (Peronospora tabacina) recurred very early in Georgia this year. The disease was observed to be severe in two second-year beds, one in Berrien and one in Lowndes County, on January 25. The symptoms were well advanced and it was apparent that the mildew had been active for two or three weeks. Seedlings were small in these beds, with leaves the size of a dime or smaller. There was an estimated kill of 50 percent in one bed and 30 percent in the other. Volunteer seedlings, some large enough to transplant, growing in the vicinity of these two beds also showed advanced stages of mildew. None of these volunteer plants had been killed although some of them apparently had been infected for several weeks. During the week of January 25 to 30 mildew was found in several new and old beds alike in these two counties, but the symptoms in these beds were not so far advanced.

The mildew was first seen in Tift County January 30, in an old bed but where no volunteer seedlings could be found. It was first seen in Colquitt County January 30 in a new bed immediately joining the location of a 1936 bed. First symptoms appeared at the Coastal Plain Experiment Station, near Tifton, February 2 in a steam sterilized bed. It was apparent that secondary infections readily occurred many miles from the nearest known points of primary infections.

The early seasonal appearance of mildew was associated with the unusually mild winter, similar in some respects to that of 1932 when the disease appeared very early and caused heavy losses in many beds. The mean temperature at Tifton for the month of January 1937 was 62° F., optimum for mildew. In addition, fogs occurred nearly every night or morning and there were only 6 clear days during the month. Although rainfall was well below normal, atmospheric conditions were ideal for mildew development.

The first week in February was clear and cooler. With continued sunny weather the disease is not expected to be disastrous. (Division of Tobacco and Plant Nutrition).

DATES OF FIRST APPEARANCE OF TOBACCO DOWNY MILDEW

For the sake of comparison a list of the earliest dates reported to the Plant Disease Survey, on which downy mildew was observed in the various States during past years is given below. It will be noticed that only in 1932 and in 1934 was it observed earlier in Georgia than Dr. Gaines has reported it this year. It would be of interest to watch the progress of the disease in 1937.

1921

Florida: March 21

	1931	1932
Louisiana:	Last half of March	Did not occur again
Florida:	May 8	About February 23
Georgia:	April 4	December 30, 1931 and January 21, 1932
South Carolina:		March 30, but apparently had been present at least three weeks
North Carolina:	May 1 (probably had been noticed April 27)	February 23
Virginia:	May 29	Reported June 8, but spray demonstrations had been carried on for four weeks
Maryland:	May	May 31
Pennsylvania:		June 15

	1933	1934
Florida:	Probably about the same as Georgia	
Georgia:	February 20	January 6
South Carolina:	March 21	April 5
North Carolina:	March 30, but noticed probably about March 21	General on May 29
Virginia:	April 24	
Maryland:	May 18	Appearing generally on May 29
Pennsylvania:	May 14	
Tennessee	May 5	Not found in 1934

	1935	1936
Florida:		March 30
Georgia:	March 7	Last week in February
South Carolina:	General during April	
North Carolina:	General during April	April 1
Virginia:	May 13	
Maryland:		May 11
Tennessee:	May 3	
Kentucky		June 8

REPORT OF THE WORK OF THE TOBACCO DISEASE SURVEY COMMITTEE FOR 1936 1/

Compiled by Luther Shaw

Introduction

The need for an annual survey for the diseases of tobacc in all of the States where the crop is grown was recognized at the first meeting of the Tobacco Disease Council, held in Greensboro, North Carolina, on November 6 and 7, 1935. In an effort to meet this need, the Executive Committee of the Tobacco Disease Council appointed in early May, 1936, a Tobacco Disease Survey Committee. Following is a list of the members of the Committee and the states represented:

Luther Shaw, Chairman, North Carolina

C. C. Allison, Tennessee	R. A. Jehle, Maryland
L. O. Gratz, Florida	E. A. Walker, Maryland
R. R. Kincaid, Florida	O. D. Burke, Pennsylvania
P. J. Anderson, Connecticut	James Johnson, Wisconsin
W. C. Nettles, South Carolina	James Godkin, Virginia
H. W. Rankin, Georgia	E. M. Johnson, Kentucky

1/ The Chairman of the Survey Committee wishes to acknowledge the able assistance of Dr. J. A. Pinckard of the Virginia Agricultural Experiment Station in abstracting this summary report from the reports submitted by the various members of the Survey Committee.

The first meeting of the Tobacco Disease Survey Committee was held in Tifton, Georgia, on June 24, 1936, when plans for the survey work were formulated and adopted.

Following is an outline of the procedure followed in the work: (1) The appointed members of the Survey Committee were held entirely responsible for the survey work in the States assigned to them; (2) results of the survey work in each State were compiled into a single report and submitted to the Chairman of the Survey Committee; (3) from the individual State reports, and from notes printed in the Plant Disease Reporter, the following summary report was prepared.

The Weather

Wide extremes in weather conditions occurred during the season of 1936 in practically all of the States where tobacco was grown. In general, excessive precipitation occurred during January, February, and March. This was followed by an unusual drought in April, May, and June. In July, August, and September rainy periods were well distributed; however, excessive precipitation occurred in most of the States in July. The effects of these abnormal weather conditions on the spread and development of tobacco diseases were unusually pronounced.

Bacterial Diseases

Angular Leafspot (Blackfire) (Bacterium angulatum). Moderate outbreaks of angular leafspot in plant beds were reported from Connecticut, Kentucky, and Wisconsin. E. M. Johnson (P.D.R. 20:188, 1936) reported finding angular leafspot in 13 of 195 plant beds examined in Kentucky. These beds were distributed through five counties and included beds of dark fire-cured, dark air-cured, and burley types. The relation of the weather to prevalence of the disease in the plant beds and subsequent development in the field were not discussed. In Wisconsin, angular leafspot infections were practically absent until early June (James Johnson, P.D.R. 20:190). "Following early June rains, however, this disease could be found in over 50 percent of the seed beds. The disease was especially striking in a few seed beds which were not cloth-covered during the season or at the time of the rains." In Connecticut, the disease was observed occasionally in plant beds but did not cause measurable loss.

Angular leafspot infections in the field were reported only from North Carolina and Virginia. In Virginia the disease did not cause any serious loss. In North Carolina a severe epiphytotic developed in the northeastern and northwestern counties following a period of excessive precipitation in early July. Of special interest is the fact that although this excessive precipitation was general over the State, the angular leafspot outbreak was confined to the regions specified, from which it could be inferred that the organism is not present in the southeastern and southwestern portions of the State. However, specific information on this point is lacking.

Granville Wilt (Bacterium solanacearum). Granville wilt was unusually severe in North Carolina during the season of 1936. In addition to normal heavy losses in Granville, Wake, and Durham counties where the disease has been widespread for several years, unusually heavy losses occurred on a large number of farms in the eastern part of the State. A general survey showed that Granville wilt is now present on individual farms in practically every eastern county in the State. The greatest increase in the number of farms reporting Granville wilt and the greatest spread of the pathogen on individual farms that has ever been noted occurred in 1936. Observations indicated that the most important agent disseminating the pathogen was water, and that the spread occurred during the heavy precipitation period which extended from January through March.

Granville wilt was reported from South Carolina, but was of minor importance in 1936.

In Virginia, Granville wilt is not widespread at present; however, infected areas appear to be increasing. The disease is now a limiting factor in tobacco production on a few farms in Halifax, Pittsylvania, and Patrick counties.

Reports on Granville wilt were not received from any of the other tobacco-growing states.

Hollow Stalk (Bacillus aroideae). Hollow stalk was reported from Virginia and North Carolina. In Virginia the disease was observed on a few plants in Pittsylvania County. In North Carolina, hollow stalk was observed in eight fields distributed through three counties. In one field of four acres in Franklin County, 5 percent of the plants were destroyed by the disease. In the remaining seven fields less than 1 percent of the plants were damaged.

Wildfire (Bacterium tabacum). In Connecticut wildfire was found in three seed beds and four fields, however, damage from the disease was relatively slight. In a survey made in Kentucky wildfire was found in 39 beds out of 195 examined (P. D. R. 20:188). In Maryland the disease was reported to have appeared on May 1, when it started to spread rapidly (P. D. R. 20: 172). Reports on its subsequent spread in Maryland were not made. A report from Pennsylvania indicated that wildfire is the most destructive and feared tobacco disease in the State. Of 29 seed beds where control measures were practiced under the supervision of the Extension Plant Pathologist, wildfire infections developed in 11 percent, while 53 percent of the beds on which control measures were not practiced showed wildfire. Forty-two growers were furnished disease-free plants to transplant approximately 140 acres. About 80 percent of these growers harvested their tobacco crop entirely free from wildfire. A small amount of the disease developed on the remaining farms, but losses were not measurable. In fields not planted with disease-free plants an average of 80 percent of the plants developed wildfire symptoms but damage was not heavy since weather conditions were not favorable for epiphytotic development.

In Wisconsin wildfire was found in plant beds on three farms. In one case a large percentage of the plants were killed and the remaining ones severely injured (P. D. R. 20:190). Later in the season wildfire was found in fields on five farms, four of which had previously shown the disease in plant beds. August rains caused serious infection in two fields set with diseased plants. There has been little evidence of spread of wildfire in Wisconsin in recent years. (P. D. R. 20:284). Wildfire was not observed in North Carolina or Virginia in 1936. Reports from other States are lacking.

Fungous Diseases

Blackshank (Phytophthora parasitica var. nicotianae). Blackshank was reported to be of general occurrence and major importance where susceptible varieties of tobacco were grown in Gadsen County, Florida. However, resistant varieties were grown in about 90 percent of the area and losses were correspondingly small, being estimated at 2 percent. A period of damp weather induced some leafspotting by the blackshank organism, however, the loss was negligible. In North Carolina some spread of the blackshank pathogen was noted. It is now well scattered over the Old Tobacco Belt, with the heaviest infestation in Forsyth County. Visits were made to several farms in North Carolina where rotations for the control of blackshank were started four and five years ago. The rotations followed on the different farms varied considerably, but most of them included two or more of the following crops: corn, cotton, wheat, oats, rye, barley, and lespedeza. Several fields in which heavy losses from blackshank occurred in 1930 and 1931 were planted to tobacco again in 1936 without measurable loss from the disease. From the observations made it seems likely that blackshank of tobacco can be controlled by a four to five-year crop rotation in North Carolina.

Blackshank was reported from Tennessee and Kentucky for the first time in 1935 (P. D. R. 19:251, 280), however, no reports have been received to date on its further spread, if any, in 1936. The disease was not found in Virginia in 1936, although its presence in adjacent counties in North Carolina is well established.

Downy Mildew (Peronospora tabacina). Reports on the prevalence of and losses from downy mildew in Georgia, Florida, North Carolina, Maryland, and Kentucky have already appeared in the Plant Disease Reporter (20:92, 136, 142, 170, and 188). Of special interest is the fact that the disease was reported for the first time in Kentucky (P. D. R. 20:188). The various reports filed and published indicated that mildew appeared in tobacco plant beds throughout the area subject to attacks by the parasite. However, owing to the general prevalence of hot dry weather the disease caused but very little damage, except in local areas where weather conditions apparently were favorable for development of the causal agent. For the tobacco growing region as a whole the loss of plants from mildew was relatively slight; however, most of the states reported some delay in transplanting as a result of the disease.

Black Root Rot (Thielaviopsis basicola). Black root rot was reported as occurring in seed beds in Connecticut but hot weather during the later part of the season assisted in the recovery of stunted plants set in the

field. The disease was observed in several fields in North Carolina, but prevailing high temperatures during the major portion of the growing season prevented development of the parasite to the extent that practically no losses occurred. The disease was reported from Pennsylvania, but only slight losses were detected. In South Carolina black root rot was reported as being a problem in plant beds this year. In Virginia the disease was not as severe as usual in the Old Belt because of high temperatures. In the Burley district, it was of general occurrence. In Wisconsin black root rot was fairly general early in the season but was obscured later by rising temperatures.

Brown Spot (Alternaria longipes). Brown spot was conspicuous in Virginia, North Carolina, and South Carolina, and was observed in Pennsylvania. No reports of the disease were made from other sections. In the Old Belt of Virginia and North Carolina the disease was widespread and serious on late tobacco. On four farms in Virginia, totaling 21 acres, the disease was estimated to have caused 75 percent loss. Several small fields were completely destroyed.

Frogeye (Cercospora nicotianae). Frogeye was reported as present in Florida, Kentucky, and North Carolina. The disease appeared to be of little consequence in any of these states.

Fusarium Wilt (Fusarium oxysporum var. nicotianae). Fusarium wilt was observed on three farms in southeastern North Carolina, where the disease destroyed approximately 40 percent of the plants on a total of 8 acres. On one farm the disease destroyed approximately one-third of the plants in a three-acre field that was cleared in the winter of 1933-34, and planted to strawberries in 1934 and 1935, and to tobacco for the first time in 1936. To the grower's knowledge the disease had never appeared on his farm before. Fusarium wilt was found on tobacco for the first time this year in Virginia.

Sore Shin (Rhizoctonia sp.). In Connecticut Rhizoctonia infections were observed in seed beds to a less extent than usual and no loss of consequence was noted. In Pennsylvania the disease was present but not serious. In North Carolina severe sore shin in the plant beds (P. D. R. 20: 136) was followed by unusually heavy losses in the field (P. D. R. 20:227).

In South Carolina sore shin was observed to be serious in a number of fields although for the State as a whole the loss was slight. In Virginia, sore shin was found on 15 out of 51 farms in Pittsylvania County. Serious losses occurred in local areas although the total for the State was estimated at about 2 percent. Warm weather perhaps contributed to the increase of the disease this season. In Wisconsin, Rhizoctonia was encountered to a limited extent in a few plant beds where it was noted as a damping-off disease. (P. D. R. 20:190).

Southern Root Rot (Sclerotium rolfsii). Southern root rot was reported only from North Carolina, where it was widely prevalent, but caused only a small amount of damage.

Nematode Diseases

Root Knot (Heterodera marioni). In Gadsen County, Florida, root knot was of major importance and reduced production approximately 5 percent, which is about average. Clean fallow, corn, and cover crops of Crotalaria spectabilis are commonly rotated with tobacco on infested soils. In Georgia root knot appeared in plant beds late in the season and was confined to old locations (P. D. R. 20:142). In Virginia, root knot was observed causing serious losses on six farms. Root knot on tobacco was not so prevalent nor severe in North Carolina during 1936 as it was in 1935. The extremely dry weather prevailing during May and June apparently delayed infection by the root knot nematode to the extent that there was not sufficient time before the tobacco matured for serious damage to be done.

Virus Diseases

Mosaic. In Connecticut mosaic is generally present each season. In 1936 it was less severe than usual on the broad-leaf types and more severe on the shade-grown varieties. In the State as a whole, the disease was estimated to have caused about 1 percent loss. In Florida mosaic was generally prevalent. Two fields were examined in which more than 40 percent of the plants were affected. The total loss from mosaic in Gadsen County was estimated to be 1 percent. In Georgia, mosaic did not appear in the field until late in the season, consequently it did very little damage (P. D. R. 20:142). Mosaic was less severe in North Carolina in 1936 than in 1935 (P. D. R. 20:227). For the State as a whole it is estimated that the disease caused a 2 to 3 percent reduction in the quantity and quality of the 1936 crop. In Pennsylvania, mosaic was present in almost 100 percent of the fields visited, which included practically all of the fields in Lancaster and Clinton Counties. The percentages of the plants affected in these fields ranged from 1 to 100. Total losses for the State were estimated at 10 percent. Counts were made in 71 demonstration fields and a direct correlation was noted between the absence of mosaic and the abstinence from the personal use of tobacco by the field workers. Eight of these fields were completely free from disease. In South Carolina, mosaic was considered more severe than in 1935. In one county losses were estimated at 10 percent. Several fields were destroyed completely. In Virginia, mosaic was observed on 11 farms out of 51 visited in Pittsylvania County. In the burley section, mosaic was of general occurrence. In one field of 8 acres in the Old Belt, 100 percent of the plants were infected. Losses in this field were confined largely to sun scald and reduction in yield. Sanitary control measures were not practiced by the workers in this field. In Wisconsin (P. D. R. 20:284), tobacco mosaic (virus 1) was conspicuous by its absence. It is believed that weather conditions were unfavorable for the distribution of soil-borne inoculum this season. Only one instance of heavy infection could be traced to diseased seed beds this year.

Other Virus Diseases: A vein-banding type of disease, presumably caused by a virus, was observed once during the season in Florida. Ring spot was observed in Pennsylvania, but no serious losses were reported. In Virginia, ring spot was more prevalent than usual and caused marked injury in certain areas of the dark fire-cured belt. In certain cases the disease

seemed to be associated with insects. In Wisconsin (P. D. R. 20:284), cucumber mosaic was less common than usual. Streak was present in about the usual amount, being uninfluenced, apparently, by the unseasonable conditions of this year.

Physiological and Miscellaneous Diseases and Injuries

Frenching (Cause Unknown): In Connecticut frenching was observed occasionally in small areas. In these cases the soil reaction was above PH 6.0. No other soil differences were noted. Frenching was found in one seed bed that was located in an old chicken yard. Soil tests showed a high reaction (above PH 6.0), and a high degree of fertility with respect to calcium, potash, and magnesia, but low in nitrates or ammonia nitrogen. Affected plants recovered quickly when set in the field. Frenching appeared at Tifton, Georgia, in steamed plant beds in late April and caused a 4 percent loss of plants. This was the second time in six years that the disease developed in plant beds at this location (P. D. R. 20:142).

Brown Root Rot: In Connecticut, brown root rot was observed in limited areas where the soils had been planted to predisposing cereals. Losses in these limited plantings were considerable. Brown root rot was comparatively rare in Wisconsin (P. D. R. 20:250).

Brown Spot on Shade Tobacco (Physiological): This disease was reported only from Connectict, where it has never been very serious, but this year it was found in more than the usual amount in several shade fields. The spots on shade tobacco differ slightly from those on other varieties, being usually smaller and more regular in outline, usually about one-eighth of an inch in diameter, quite circular, numerous on a leaf, dark chestnut brown on both surfaces, without concentric rings. Microscopic examinations and isolation experiments have failed to show any organism connected with these spots.

Sun Scald: Sun scald was reported as general in Connecticut and North Carolina.

Lightning Injury: About the usual amount of lightning injury was reported during the season.

Leaf Burn: In Florida, leaf burn, caused by strong wind and cool weather was observed in several plant beds.

Shed Burn and Pole Rot: Shed burn and pole rots were reported as causing considerable damage during damp weather in Wisconsin and Connecticut.

OCCURRENCE OF CURLY TOP IN THE PACIFIC NORTHWEST IN 1936

B. F. Dana

The 1936 season was the third consecutive year in which curly top occurred in more than usual severity on vegetables and other susceptible hosts. Unprecedented low temperatures occurred during the last week of October, 1935, which undoubtedly reduced the amount of vegetation upon

which beet leafhoppers, vectors for curly top, could survive the winter. Direct reduction of leafhopper populations was also to be expected. A second abnormally cold spell was experienced during the last week in March and the first week in April, 1936. Whatever unfavorable effect these cold spells may have had on the leafhopper populations was evidently overbalanced by favorable conditions for spring growth of mustards and other host plants, which continued into early summer and furnished ideal conditions for building up the large populations of vectors necessary for the dissemination of the virus on a scale sufficient to produce an epiphytotic of curly top.

The following observations indicate the prevalence in 1936 of curly top in representative areas, most of which were visited by the writer during the growing season. Curly top appeared later than in 1935 and in many areas after some of the crop had been picked.

Oregon

Willamette Valley

In market gardens throughout the valley curly top was present in tomato fields in a trace to 1 percent of the plants. The disease appeared and plants succumbed before maturing fruit. Losses closely paralleled the percentage of disease. Losses in other susceptible hosts were negligible.

Portland Area

In the lower Columbia area near Portland, a slightly larger percentage of tomatoes were affected. Losses were not over 5 percent in any field observed. No curly top occurred in Detroit Dark Red mother beets produced late in 1935 or in roots from seed planted during July of the present year for the 1937 seed crop.

Rogue River Valley

In the Rogue River Valley observers reported a trace of curly top with little loss.

Hood River-Dalles Area

The Hood River area was visited July 27. A representative tomato field of three acres showed only a trace of curly top. Fruit was not yet mature. At the same time the Dalles area showed a trace to 1 percent curly top in tomato. The earliest crop trained to stakes was beginning to ripen. A few fields developed more curly top as the season progressed. Because of delayed appearance of curly top, the market crop in this area was damaged less than in 1934 or 1935.

Bend-Redmond Area

No tomatoes matured in home gardens due to early death of plants from curly top. Other susceptible garden crops such as spinach and snap beans were severely injured.

Washington

Yakima Valley

July 28, a number of market garden fields were examined in the vicinity of Donald, Wapato, and Toppenish. The following observations represent the curly-top situation. Only a small portion of the tomato crop had been picked.

Tomato	3 acres	60% disease	60% loss
Tomato	10 acres	75% disease	75% loss
Tomato	10 acres	50% disease	50% loss
Tomato	6 acres	15% disease	15% loss
Tomato	10 acres	30% disease	30% loss
Tomato	6 acres	20% disease	20% loss
Tomato	5 acres	30% disease	30% loss
Tomato	5 acres	30% disease	30% loss
Pepper	1/2 acre	15% dwarf	10-15% loss
Pepper	1/2 acre	15% dwarf	10-15% loss
Table Queen Squash	1/2 acre	15% of plants diseased	5-10% loss
Straightneck Squash	1/2 acre	50% of plants diseased	50% loss
Connecticut Field Pumpkin	1/2 acre	Yellowing and tip injury	loss not estimated

Kennewick Section

July 28, the tomato fields grown for cannery purposes at Kennewick showed curly top in 10 to 75 percent of the mature plants, with an estimated average loss of crop of 30 percent for the district. Seeding directly in the field in drill rows is practiced. At this time the first of the crop was ripening.

Clarkston Section

August 1, tomatoes in home gardens and small acreages for local cannery showed 10 percent of plants with curly top.

Milton-Freewater Area

In the Milton-Freewater area curly top in market tomatoes was very severe during the last part of the picking season, shortening the crop season. On July 30, 80 percent of plants in the Sunnyside District showed curly-top symptoms. Crop loss was estimated at 50 percent.

Ontario Section

The Ontario district, in the Snake River Valley, was visited August 2. Only a few susceptible vegetables are grown because of frequent losses from curly top.

The following conditions were found on the farm of a market gardener:

Tomatoes for market	10% of plants dead
Pepper	15% of severe curly top dwarf
Cucumbers for market	15% of severe curly top dwarf
Table beets	100% infection resulting in abandoned field.

Puget Sound Section

Notes on curly top occurrence by G. H. Huber, Plant Pathologist, of the Western Washington Experiment Station appeared in the Reporter for December 1, 1936, page 333.

Walla Walla and Yakima Sections

Notes by Leon K. Jones, Associate Plant Pathologist of the Washington Experiment Station on curly top occurrence on tomato appeared in the Reporter for August 15, 1936, page 234.

Idaho

Only limited observations were made in Idaho.

August 1. Lewiston. A large market garden was examined in detail and the following notes made. The observation for Lima bean is the first curly-top injury noted on this crop.

Cucumber	Ames Hybrid	100% loss
Cucumber	Other varieties	Serious injury
Cantaloup	Several varieties	Slight injury
Pepper	Several varieties	15% dwarfed plants
Tomato	Several varieties	50-60% loss
Bush Lima Bean		One plant with vein clearing symptoms
Summer Squash	Straightneck	100% loss
Summer Squash	Zucchini	75% diseased plants

Losses in tomatoes for the district were estimated at 10-20 percent.

August 1. White Bird.

Tomato	2 gardens	50% loss
Tomato	1 garden	75% loss

Salmon River Highway

Tomato	2 gardens	10% loss
Slate Creek	1 garden	50% loss
Riggins	1 garden	Trace

August 2. Weiser

Tomato	Gardens	Very small amount of injury

Parma

Watermelon	Garden	One plant with vein clearing symptoms
Zinnia	Test Garden	Dwarfing
Cucumber	Garden	Dwarfing
Squash, Hubbard	Garden	100% yellowing and rosette

August 4. Twin Falls

Tomatoes	Gardens	Only trace of injury throughout district

(Division of Fruit and Vegetable Crops and Diseases).

AN ASCOCHYTA LEAF SPOT OF POTATO IN OREGON

F. D. Bailey and Roderick Sprague

A leaf spot of potato caused by a fungus referable to Ascochyta lycopersici Brun. has been collected near Siletz, Lincoln County, Oregon. We have local collections made as early as September, 1911 and there are others as late as October 1934, but apparently this fungus has not been reported previously from Oregon. It has been found associated with early blight lesions and may frequently have been confused with that trouble.

The fungus produces a brown, concentrically zoned spot that reaches 15 mm. in diameter. The Ascochyta spot differs from the Alternaria spot in its lighter colored lesions with somewhat wider spaced and less prominent zonations. It appears to be an active parasite once infection has taken place but the rather sparse distribution of the spots where it has been observed, indicates that it is not capable of serious damage in Oregon. Early blight shows more effective dissemination, but rarely causes appreciable damage to potato tops in Oregon.

The pycnospores of A. lycopersici are variable in size, averaging 8-14 x 1.8-4 microns. They germinate readily in culture producing, on potato dextrose agar, a grey to pallid buff, mottled cottony growth above a black substratum.

One inoculation trial resulted in the production of characteristic lesions on potato and tomato. The disease needs critical study. (Oregon Agricultural Experiment Station cooperating with Food and Drug Administration, Insecticide Division; and Bureau of Plant Industry, Division of Cereal Crops and Diseases).

HEAVY LEAF RUST INFECTION OF CEREALS IN GEORGIA

H. W. Rankin

Crown rust (Puccinia coronata) of oats has appeared over practically all the State at this early date and is already doing a considerable amount of damage in southern Georgia. From present indications infection will be so heavy by harvest time that the crop will be very short. Leaf rust (P. rubigo-vera tritici) is beginning to appear on wheat and it is probable that this crop also will be severely damaged.

During January the weather was extremely mild, and rainfall was heavy. In normal years leaf rust appears on our small grain crops only a few weeks before harvesting. (Feb. 9, College of Agriculture, University of Georgia).

CYTOSPORA CANKER OF SPRUCE

Alma M. Waterman

Numerous reports have been made recently in the Plant Disease Reporter of the occurrence of the canker on spruces recently described by Gilgut (Proc. 12th National Shade Tree Conference 1936:113-118) as caused by Cytospora kunzei. The reports have been mainly from Massachusetts and Ohio with one mention of its occurrence in New Jersey. Since 1930 several specimens of the disease have been received by the Division of Forest Pathology at its Providence and New Haven branches showing a range of hosts and distribution as follows: on Picea pungens (including P. pungens glauca kosteri) from Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Minnesota; on P. excelsa from New York, Rhode Island, Pennsylvania, Illinois; on P. glauca from Massachusetts; on P. rubra from Maine; and on P. orientalis from New York and Pennsylvania. (Division of Forest Pathology, Bureau of Plant Industry, in cooperation with the Osborn Botanical Laboratory, Yale University).

TREE DISEASES IN MASSACHUSETTS 1/

Malcolm A. McKenzie

In a survey of shade tree diseases in Massachusetts, approximately 5,000 specimens have been studied at the Shade Tree Laboratory of Massachusetts State College since the establishment of the laboratory in June, 1935. Because the great majority of shade trees in Massachusetts are elms, the threat of the Dutch elm disease has aroused considerable anxiety in the

1/ This report includes the results of a survey made possible by cooperation of F.E.R.A. and W.P.A. organizations and the Massachusetts Forest and Park Association, together with the Massachusetts Agricultural Experiment Station. The entire project was under the direction of Professor A. Vincent Osmun, head of the Department of Botany in Massachusetts State College.

State concerning the future of this important tree. To date, Connecticut is the only New England State known to be invaded by this disease, but affected trees have been found within fifty miles of Massachusetts, in New York as well as in Connecticut.

Diseases of the woody parts of elms have been observed as widely distributed in Massachusetts in association with species of the following fungi: Cephalosporium 2/, Verticillium 2/, Fusarium, Sphaeropsis, Phomopsis, Diplodia, Coniothyrium, Vermicularia, Cytospora, and bacteria.

Leaf diseases have been abundant on elms this year but the only one observed in epidemic form was the black-spot caused by Gnomonia ulmea. The heaviest infection was observed in the southwestern part of the State.

Leaf diseases have been abundant also on many other shade trees, particularly maple, sycamore, ash, horsechestnut, catalpa, birch, poplar, oak, and willow.

Several species of maple have shown the effects of Verticillium wilt to a greater extent this year than at any time during the past five years. In some cases affected trees have been observed to wilt completely and die rather rapidly while other trees may be affected only to the extent of losing one or two branches. In years of drought this disease appears to cause its worst ravages particularly on street trees which are always struggling under serious handicaps in our modern cities.

Verticillium was found associated with a wilting of peach in Massachusetts this year. New York, New Jersey, Michigan, and California have reported similar peach wilting.

Some of the more important diseases of forest and ornamental trees observed during the past year include the white pine blister rust, the European larch canker, needle blight of Colorado fir, the Cytospora canker of spruce, Strumella canker of oak, Nectria canker on several hosts, and chestnut blight. Also during 1936 the European larch canker fungus was reported in Massachusetts on golden larch (Pseudolarix amabilis) by Miller and Aldrich (Science 83:499, 1936).

The Cytospora canker of spruce is known to occur widely throughout Massachusetts and the eastern United States. This disease and similar cankers of other coniferous trees have been observed by the writer in nurseries, forest plantings, and on ornamental trees.

Field investigation has shown that a number of trees in New England are suffering from environmental conditions. It is apparent that precautions should be taken against injuring trees in the following activities:

2/ A detailed report on the distribution of Cephalosporium and Verticillium in Massachusetts has been compiled by Miss Eunice M. Johnson in connection with this survey. See page 58.

road construction, removal of snow from drives and highways, the use of chemicals on roads, the laying of drain pipes, building of foundations and walls, the removal and replacement of soil for any reason, installation and maintenance of power and gas lines, and watering, feeding or fertilizing trees. Feeding and fertilizing without proper care or direction may actually be harmful to a tree. Excessive moisture due to the flood of March, 1936 (Science 83:412-413, 1936) killed some of our New England shade trees. In the Connecticut Valley many trees were uprooted and are now a total loss. Other trees suffered from the destruction of limited areas of the cambium layer by ice floes, or from the washing away of soil. In the Merrimac Valley crude oil deposited upon trees in flooded areas caused serious burning and sometimes death.

Injuries to trees caused by the following fungous diseases in Massachusetts were observed upon specimens received at the Shade Tree Laboratory during 1936. The listing is by hosts alphabetically arranged according to scientific names.

Abies concolor. White Fir:
Blight (Rehmiellopsis bohemica)

Acer spp. Maples:
Canker (Cytospora sp.)
Canker (Nectria galligena)
Leaf-blight (Gloeosporium sp.)
Leaf-spot (Phyllosticta minima)
Tar-spot (Rhytisma acerinum)
Leaf-blister (Taphrina sp.)
Maple wilt (Verticillium sp.)

Aesculus hippocastanum. Horse-chestnut:
Leaf-blotch (Guignardia aesculi)

Berberis thunbergii. Japanese Barberry:
Wilt (Verticillium sp.)

Betula spp. Birches:
Leaf-spot (Gloeosporium sp.)
Canker (Nectria sp.)
Yellow-leaf blister (Magnusiella flava)

Buxus sempervirens. Box:
Leaf-blight (Macrophoma candollei)
Leaf-spot (Phyllosticta sp.)
Leaf-spot (Volutella buxi)

Castanea spp. Chestnuts:
Chestnut blight (Endothia parasitica)

Catalpa sp. Catalpa:
Leaf-spot (Gloeosporium sp.)
Leaf-spot (Phyllosticta catalpae)

Celtis sp. Hackberry:
Leaf-spot (Phyllosticta sp.)

Chamaecyparis sp. White cedar:
Rust (Gymnosporangium sp.)

Comptonia asplenifolia. Sweet fern:
Rust (Cronartium comptoniae)

Crataegus spp. Hawthorns:
Rust (Gymnosporangium sp.)

Fraxinus sp. Ash:
Rust (Puccinia fraxinata)

Juniperus sp. Red cedar:
Rust (Gymnosporangium juniperi-virginianae)

Larix europaea. European larch:
European larch canker (Dasyscypha willkommii)
Canker (Cytospora sp.)

Malus spp. Apples:
Rust (Gymnosporangium juniperi-virginianae)

Picea excelsa. Norway spruce:
Canker (Cytospora sp.)

Picea pungens glauca. Colorado blue spruce:
Canker (*Cytospora* sp.)

Pinus rigida. Pitch pine:
Gall rust (*Cronartium cerebrum*)
Rust (*Cronartium comptoniae*)

Pinus strobus. White pine:
Blister rust (*Cronartium ribicola*)
Canker (*Cytospora* sp.)
Canker (*Nectria* sp.)

Pinus sylvestris. Scotch pine:
Gall rust (*Cronartium cerebrum*)
Rust (*Cronartium comptoniae*)

Platanus sp. Sycamore:
Anthracnose (*Gnomonia veneta*)
Leaf-spot (*Phyllosticta* sp.)

Populus spp. Poplars:
Canker (*Cytospora chrysosperma*)
Rust (*Melampsora medusae*)
Yellow-leaf blister (*Taphrina aurea*)

Prunus spp. Cherries:
Black-knot (*Plowrightia morbosa*)
Wilt (*Verticillium* sp.)

Pseudotsuga taxifolia. Douglas Fir:
Canker (*Phomopsis pseudotsugae*)
Needle cast (*Rhabdocline pseudotsugae*)

Quercus spp. Oaks:
Canker (*Cytospora chrysosperma*)
Anthracnose (*Gnomonia veneta*)
Canker (*Strumella coryneoidea*)

Rhododendron sp. Rhododendron:
Leaf-spot (*Phyllosticta* sp.)

Ribes sp. Currant:
Blister rust (*Cronartium ribicola*)

Salix spp. Willows:
Tar-spot (*Rhytisma salicinum*)
Scab (*Fusicladium saliciperdum*)

Syringa sp. Lilac:
Leaf-spot (*Phyllosticta* sp.)

Tsuga canadensis. Hemlock:
Canker (*Phomopsis juniperovora*

Ulmus spp. Elms:
Wilt (*Cephalosporium* sp.)
Wilt (*Verticillium* sp.)
Wilt (*Fusarium* sp.)
Canker (*Phomopsis* sp.)
Canker (*Sphaeropsis* sp.)
Canker (*Cytospora* sp.)
Canker (*Coniothyrium* sp.)
Canker (*Nectria cinnabarina*
Leaf-spot (*Gloeosporium inconspicuum*)
Black-spot (*Gnomonia ulmea*)
Leaf-spot (*Mycosphaerella ulmi*)
Leaf-spot (*Phyllosticta* sp.)
Leaf-blister (*Taphrina* sp.)

DISTRIBUTION OF CEPHALOSPORIUM AND VERTICILLIUM ON ELM IN MASSACHUSETTS

Eunice M. Johnson

Approximately 75 percent of the 5,000 specimens received at the Shade Tree Laboratory in Massachusetts State College during 1935 and 1936 were collected from elm trees. One important result of the laboratory studies has been the information gathered concerning the distribution of the elm wilts caused by species of *Cephalosporium* and *Verticillium*.

The accompanying map and list show the distribution of both organisms in the State. In this survey *Cephalosporium* was found to be by far the more common of the two organisms. Its widespread distribution presents a real problem to owners of elms in Massachusetts.

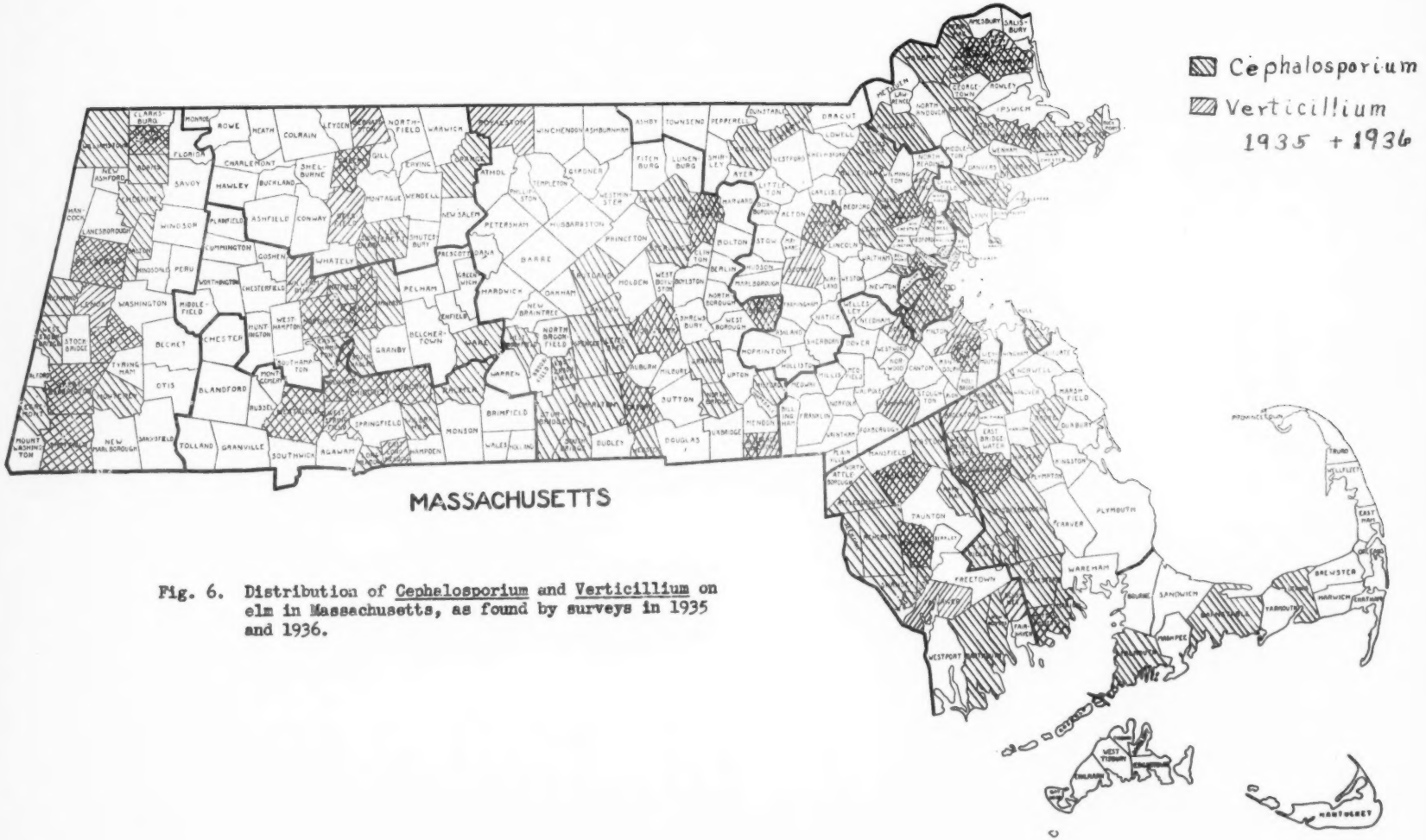

Fig. 6. Distribution of Cephalosporium and Verticillium on elm in Massachusetts, as found by surveys in 1935 and 1936.

1935 and 1936

Town	Cephalosporium	Verticillium
Abington	1	
Acushnet		1
Adams	1	
Amherst	2	
Andover	2	
Attleborough	1	
Barnstable	1	
Bernardston		1
Beverly	1	
Billerica	1	
Blackstone		1
Boston	3	6
Boxford	1	
Braintree	2	2
Bridgewater	3	1
Brockton		1
Brookline	3	
Burlington	1	
Cambridge	2	1
Charlton	5	
Cheshire	3	
Chicopee	3	3
Cohasset	1	
Concord	2	1
Dalton	1	
Dartmouth	3	
Dedham	1	
Deerfield		1
Dennis	1	
Dighton	1	1
East Brookfield	1	
Easthampton	5	
East Longmeadow		1
Easton	4	
Egremont	9	1
Essex	1	
Fall River		1
Falmouth	3	
Gloucester	2	
Grafton	1	
Great Barrington	9	1
Greenfield	4	4
Groton	2	
Groveland	1	
Hadley	4	1
Halifax	5	
Hamilton	1	1
Hatfield	3	
Haverhill	3	
Holyoke	43	59
Lakeville	1	
Lancaster	2	1
Lee	12	1
Leicester	3	
Lenox		1
Leominster	1	
Leverett	1	
Lexington	1	
Longmeadow	1	
Ludlow	5	1
Marion	2	
Mattapoiset	3	1
Merrimac	2	
Middleborough	1	
Milford	1	
Millville	17	3
Monterey	3	
Nahant	7	
Newbury	2	1
New Bedford	4	
North Adams	2	2
Northbridge	2	
Northampton	14	11
Norton	1	1
Orange	1	
Oxford	1	2
Palmer	1	
Paxton	3	
Peabody	1	
Pembroke	1	
Pittsfield	1	5
Quincy		3
Raynham	1	
Reading		2
Richmond	2	
Rehoboth	3	
Rochester	1	
Rockland	1	
Royalston		1
Rutland	1	
Salem	1	
Saugus	1	
Seekonk	1	
Sharon		1
Sheffield	18	2
Somerset	4	
Southborough	17	4
Southbridge	2	
South Hadley	3	
Spencer	1	
Sterling	1	
Stoneham	2	1
Sturbridge	3	
Sudbury		1
Sunderland	1	
Swansea	1	
Tewksbury	3	
Topsfield	1	
Tyngsborough	3	
Ware	2	
Watertown	1	
Webster	1	
West Bridgewater	3	
West Brookfield	3	
Westfield	2	2
West Newbury	4	1
West Springfield		1
West Stockbridge		1
Wilbraham		1
Williamsburg	1	
Williamstown	1	
Woburn	2	1
Worcester	1	1
TOTAL	337	142

WINTER INJURY TO TREE AND SMALL FRUITS IN IDAHO 1935-1936

E. C. Blodgett

Orchardists and small fruit growers in most fruit sections of the country are rather frequently concerned with the results of freezing temperatures. Late spring frosts, killing fruit blossoms or deforming set fruit, often cause considerable worry and crop losses. Sudden drops in temperature during winter may result in severe injury to tree trunks, branches, and roots. These effects, together with the sudden dying of weakened trees, are in many cases traceable directly or indirectly to the continual changes and severe extremes in temperatures. It is very common to find winter injury killing trees or small fruit plants that are weakened by disease or other conditions. In both irrigated and non-irrigated sections, shortage of water or drought may contribute to severe winter injury.

These more or less common occurrences, however, are minor compared to the results of low temperatures in 1935-1936. Certain fruit sections of Idaho and adjacent States probably never before have experienced such early and disastrous freezes as occurred in October-November, 1935. This was the coldest November recorded in Idaho (records began in 1893), being 6.4° below normal.

Although more than a year has passed since the freeze, not all results of the injury are visible as yet, and after-effects will no doubt continue to express themselves in weak and dying trees and generally unprofitable orchards for several years. It is possible now, however, more nearly to estimate losses than it was at any time up to the middle of the 1936 growing season. Such widespread interest is evident in the problem that this discussion is prepared with the hope that it will give some actual facts of interest to others. The writer wishes to express his indebtedness to Dr. C. W. Hungerford, Department of Plant Pathology, University of Idaho, for valuable suggestions and to Dr. Leif Verner, Department of Horticulture, University of Idaho, for making available the data for varieties and for timely advice.

In Table 6 are found maximum and minimum temperatures for the last half of October and the first half of November for five weather stations in representative fruit growing sections of the State. The last few days of October were moderately cold (14°) in southern Idaho and very cold (2°) in the northern section. Between November 1 and 6, however, extremely low temperatures prevailed over practically the whole State. At Moscow the temperature reached 0° on November 2 and 3, and at Lewiston was 10° and 9° for these dates. At Weiser the reading was 9° on November 4; at Twin Falls, 1°; and at Boise, 8°. It should be mentioned, too, that in fruit sections within 50 miles of Boise a low of -7° was reached. These readings are extremely low coming as they do after previous warm weather and only light frosts.

Table 6. Maximum and minimum temperatures in Idaho, October 15 to November 15, 1935, with reference to winter injury of tree and small fruits in 1935-1936.

Date	Weather Stations: Boise Max.	Boise Min.	Twin Falls Max.	Twin Falls Min.	Weiser Max.	Weiser Min.	Moscow Max.	Moscow Min.	Lewiston Max.	Lewiston Min.
1935										
Oct. 15	58	43	56	41	67	42	53	35	62	44
" 16	58	38	56	31	66	37	54	30	65	42
" 17	64	36	60	26	69	28	63	36	71	40
" 18	67	37	66	25	72	30	68	39	74	41
" 19	62	40	71	27	70	32	49	35	58	39
" 20	51	29	62	37	59	26	46	28	56	35
" 21	45	27	48	27	54	34	42	23	43	31
" 22	50	27	47	25	60	27	45	31	54	32
" 23	51	24	49	15	58	19	47	28	55	29
" 24	56	26	54	15	52	20	56	28	59	29
" 25	65	32	62	26	73	24	61	34	58	29
" 26	71	37	67	27	77	28	65	31	61	30
" 27	73	38	70	26	72	26	66	39	61	29
" 28	72	40	74	24	67	26	49	37	54	31
" 29	42	29	61	28	52	34	37	22	38	33
" 30	30	22	35	18	43	25	22	14	28	24
" 31	37	23	39	14	32	23	25	2	32	16
1935										
Nov. 1	29	24	37	24	35	23	26	7	34	15
" 2	26	19	34	18	41	24	25	0	31	10
" 3	26	11	23	15	31	13	32	0	36	9
" 4	28	8	27	1	36	9	35	11	41	10
" 5	30	13	31	6	38	12	40	28	46	17
" 6	38	21	35	11	40	16	52	33	56	26
" 7	41	23	45	16	40	16	51	32	53	26
" 8	40	23	47	20	39	19	47	36	50	26
" 9	46	28	43	31	47	29	45	27	43	33
" 10	40	21	37	20	46	17	40	18	48	25
" 11	48	27	42	18	44	24	43	31	49	25
" 12	49	28	50	20	49	26	45	33	51	29
" 13	46	31	42	26	58	24	41	32	49	35
" 14	47	27	42	18	49	17	41	29	48	27
" 15	48	40	46	24	41	22	42	34	40	27
Alt. of Station:	2,739 ft.		3,770 ft.		2,114 ft.		2,628 ft.		757 ft.	

Late apples were frozen on the trees and in nearly all cases were worthless. Fruit stored temporarily in the orchard or open sheds was damaged severely, and much of it broke down later. All trees were practically in full leaf, and some of the late-watered young trees were still growing. The leaves and frozen apples in many orchards persisted throughout the winter and were still evident at blossoming time and later in the spring of 1936. Some young trees died outright; others were nearly completely girdled near the crown and managed to live until the latter part of the 1936 growing season. Fruit buds on old trees in many cases were killed or severely damaged, resulting in a poor crop. Whole branches or parts of trees died or were weakened by bark splits and cankers and were unable to heal. Evidence of various forms of trunk splitting and collar rots was very common during the 1936 season. In general, the apple trees in northern sections--Lewiston, Moscow, Coeur d' Alene--were badly damaged, while in southern sections damage was mainly to young trees. In the south, however, there was a general feeling of growers and some evidence that buds and trees were injured sufficiently to reduce the set and carrying capacity of trees.

Injury to peaches, cherries, and apricots was general but far more serious in northern districts. At the time of the freeze, these trees, especially cherries, were in full leaf, some still growing. Of all the trees the sweet cherries suffered most. Whole trees, young or old, died outright, and the wood dried before spring. Some appeared dead but blossomed feebly and then sent out fairly vigorous shoots from adventitious buds. Certain orchards blossomed fairly heavily and matured a moderate crop. It was a common occurrence to find trees suddenly dying in June or July after making a good start. Frequently these showed severe trunk and crown injury approximating fatal girdling. Examination of buds and twigs in the latter part of November of 1935 gave evidence that the buds were generally unharmed, but the cambium area and conducting tissue were dark and dead.

Low temperatures in February were very severe (Table 7). Over the State it was the fourth coldest February since 1894 and averaged 7.3° below normal. In the northern division it was the coldest February recorded, averaging 13.0° below normal. After this February freeze, fruit and especially leaf buds commonly were dead, and more extensive wood injury was evident. It is possible that buds died from the effects of the fall freeze only, but it seems reasonable to suppose that the extremely cold weather of February added to the damage materially.

Seasonable weather and occasional warm periods in March developed buds rather fast, and it is believed that very cold weather about April 1 contributed materially to increased injury and death of buds. Temperatures at Moscow on March 29, 30, 31, and April 1 were 18°, 16°, 18°, and 11°, respectively. Peach trees in southern Idaho were not damaged much, and a heavy crop of good quality was produced in 1936. In northern Idaho, however, injury was severe to fruit buds and killed some trees outright. It is believed that the peaches survived better than cherries due to earlier maturity of the wood in the fall. Records at Lewiston showed a good crop of peaches on Mayflower, Rochester, Hale Haven, and at least two seedling types. Carman bore some fruit.

Table 7. Maximum and minimum temperatures in Idaho in February 1936 with reference to winter injury of tree and small fruits in 1935-1936.

Date	Weather Stations: Boise Max.	Boise Min.	Twin Falls Max.	Twin Falls Min.	Weiser Max.	Weiser Min.	Moscow Max.	Moscow Min.	Lewiston Max.	Lewiston Min.
1936										
Feb. 1:	22	6	20	5	17	-9	23	7	30	11
" 2:	25	9	21	15	30	12	20	4	26	9
" 3:	24	3	21	9	24	0	19	5	28	12
" 4:	29	20	29	9	29	16	22	14	30	11
" 5:	33	17	30	14	30	15	30	14	42	18
" 6:	41	29	36	21	45	22	32	17	42	18
" 7:	30	-3	35	11	38	9	17	-10	9	8
" 8:	16	-3	15	-11	16	-6	7	-14	11	-6
" 9:	25	1	21	-6	24	-1	8	-6	20	0
" 10:	31	14	31	4	32	13	16	6	23	9
" 11:	27	15	31	6	26	9	20	6	31	14
" 12:	44	24	43	30	34	22	18	12	24	16
" 13:	45	21	42	23	43	17	12	-20	12	2
" 14:	34	19	35	20	34	14	10	-2	16	-2
" 15:	30	12	33	18	31	1	10	-19	7	-9
" 16:	31	14	32	22	38	8	6	-14	12	-10
" 17:	33	14	31	17	29	7	14	-16	8	-12
" 18:	33	22	33	13	33	20	9	-5	17	-4
" 19:	33	26	38	25	36	22	20	2	24	5
" 20:	45	29	41	26	41	29	30	10	33	14
" 21:	55	40	43	31	44	30	37	20	36	20
" 22:	57	41	48	38	52	32	48	35	49	24
" 23:	47	30	48	33	42	30	40	28	44	25
" 24:	38	26	38	33	37	22	30	21	39	23
" 25:	37	27	37	23	34	13	31	20	47	26
" 26:	46	28	44	21	38	20	40	30	51	27
" 27:	51	34	49	29	45	29	41	35	52	36
" 28:	51	32	47	29	48	26	44	34	57	35
" 29:	54	31	47	27	44	24	49	36	52	35
Mean	36.8	19.9	35.1	18.1	35.0	15.4	24.2	8.6	29.7	12.2

Apricot trees in southern Idaho were injured to some extent, and during the season trees went down seriously. As with cherries, there was generally trunk and crown injury and subsequent girdling. In northern Idaho there was no crop. Some trees died. At Lewiston, trees headed back made good growth and probably will survive.

Vinifera grapes in the Lewiston section were severely damaged, and a very short crop was produced. American species were not seriously injured.

Prune trees, while nearly matured for the season at the time of the fall freeze, were in many cases severely injured. Most of the prunes are grown in southern Idaho. Just how much injury there was to buds is very difficult to estimate, but considerable reduction in vitality of the trees, a large fruit drop, an increase in dead wood, and frequent trunk and crown injury was found.

Strawberries in northern Idaho east of Moscow were damaged severely. Apparently there was not excessive plant killing, but the crop in 1936 was about 10 percent of normal. In southern Idaho much less injury was found.

Bramble fruits in nothern Idaho showed wide varietal differences. Some plants were killed; others did not fruit in 1936 as a result of the freeze. There was good evidence that plants making a uniform growth throughout the season (under favorable conditions) were very resistant to injury. Greater damage was caused to plants making late fall growth after adverse conditions had prevailed earlier in the season.

Most of the Persian (English) walnut trees in Lewiston were top-killed, but subsequently sprouted at the base.

At Moscow the following records were taken on varietal resistance: Moorpark apricots were completely killed, while Royal apricots in the same row showed practically no injury. Abundance plums were killed, while Italian prunes were uninjured. Seneca cherry proved hardier than Lambert, which is much hardier here than either Bing or Napoleon. Wagener apples were killed or severely injured, and Rome Beauty trees suffered extensive killing of twigs and spurs but were uninjured in the trunks and main branches. The extent of winter injury was characteristically variable.

One definite result of the freeze is that growers setting out new plantings are more careful in selecting hardy sorts and, furthermore, it has called attention to improper use of cultural and irrigation practices in orchards and to advantages of mulching and protection of small fruits. (Idaho Agricultural Experiment Station).

EFFECTS OF THE AUTUMN 1935 COLD WAVE ON FOREST TREES IN NORTHERN IDAHO

R. K. Pierson and John Ehrlich

During the autumn of 1935 an abnormally early and severe cold wave occurred in northern Idaho (and throughout the Pacific Northwest) from October 29 to November 4. At Clarkia, Shoshone County, an unofficial minimum of -16° F. was observed, and farther south on the Nez Perce National Forest in Idaho County an official minimum of -9° F. was recorded. This period followed September and early October official mean temperatures above normal and precipitation below normal. The cold wave was followed by a conspicuous browning of the coniferous forests and an abnormal retention of dead deciduous foliage in eastern Washington, northern Idaho, and western Montana.

Western white pine, Pinus monticola D. Don., seemed to be the most severely injured, the damage ranging from death of only the current season's foliage to death of all the foliage and some of the buds.

Douglas fir, Pseudotsuga taxifolia (LaMarck) Britton, lowland white fir, Abies grandis Lindley, Engelmann spruce, Picea engelmanni Engelm., and western hemlock, Tsuga heterophylla (Raf.) Sarg., suffered considerable browning, followed by premature needle casting. There was also variable killing of buds, particularly on Douglas fir.

Ponderosa pine, Pinus ponderosa Lawson, lodgepole pine, P. contorta Loudon, and western red cedar, Thuja plicata D. Don., showed various degrees of yellowing and browning, but in most instances the normal green color was recovered in 1936. (University of Idaho School of Forestry).

EFFECT OF EARLY FROSTS ON PINUS MONTICOLA IN NORTHERN IDAHO IN 1935

R. K. Pierson and John Ehrlich

During nightly frosts occurring on August 15 and 16, recorded temperatures in the vicinity of Elk River and Bovill, Clearwater and Latah counties, Idaho, dropped to a minimum of 25° F., following daily maxima of 85° F. By the second week in September, the current season growth of western white pine, Pinus monticola D. Don., showed pronounced symptoms attributed to cold injury resulting from the August frosts. The marked occurrence of symptoms on seedlings and saplings in low-lying areas or typical frost pockets, as well as the fact that the symptoms were characteristic of frost injury, substantiated this opinion.

The outstanding symptoms were death of the terminal bud and shoot and in some cases also of the lateral buds and shoots. Occasionally the leader shoot drooped (simulating the effects of weeviling in Pinus strobus L.), indicating that the leaders were still succulent at the time of injury. Usually the new shoots have hardened by the middle of July, but it is possible that the severe drought characterizing the 1935 growing season so reduced normal metabolic activity as to leave the plants susceptible to cold injury. Thus it appears that the localized damage to white pine reproduction in this part of Idaho was due to the combined effects of high susceptibility to cold injury and of severe early frosts.

Ultimate damage can not yet be predicted, but the appearance of the trees in 1936 suggests that very few are likely to die outright and that the detrimental effects may be limited to forked and deformed boles, losses in height growth and increment, and possible damage from insects and fungi capable of entering by way of the dead tissues. (University of Idaho School of Forestry).

EFFECTS OF THE AUTUMN 1935 COLD WAVE ON ORNAMENTALS IN NORTHERN IDAHO

George W. Woodbury

Severe injury occurred in English oak, Quercus robur L. Although scattered branches produced foliage last season, it seems unlikely that many of the trees will survive through the coming summer. Practically all specimens were extensively injured. This species has been perfectly hardy in the vicinity of Moscow for many seasons.

Amur privet, Ligustrum amurense Carr., froze completely to the ground. The roots, however, suffered no severe injury as shown by the fact that reproduction took place rapidly from underground portions of the plants.

Newly made plantings of Weigela rosea Lindl. (Diervilla florida Sieb. & Zucc.) were completely killed while older plantings of this and related species suffered severe injury.

Single specimens of Salix discolor Muhlenb. and Juglans hindsii Rhed. were severely injured in the Lewiston area. The latter developed shoots from adventitious buds on the trunk during the summer of 1936.

Widespread injury of Siberian elm, Ulmus pumila L., was evident. This injury amounts to extensive killing of twigs and smaller branches. The condition varies considerably from one tree to another even when growing in the same location. Trees were entirely killed in some instances. (Idaho Agricultural Experiment Station).

JANUARY WEATHER

(From the Weekly Weather and Crop Bulletin for the week ending February 2, 1937.)

January 1937, was characterized by marked extremes of weather conditions in different portions of the country. The outstanding features were the heavy rains and disastrous floods in the Ohio Valley and the two severe freezes in the far West, especially in the southern half of California.

Figure 7 shows that the month had abnormally warm weather east of the Mississippi River, and severely low temperatures in most western sections, the dividing line between the cold and warm areas conforming roughly to the Mississippi River. In the Eastern States the monthly mean temperatures ranged generally from 10° to 14° above normal, making it one of the warmest Januaries of record. On the other hand, from the central and northern Great Plains westward the deficiencies in temperature were equally marked, ranging from 10° to as many as 20°. For the month as a whole the

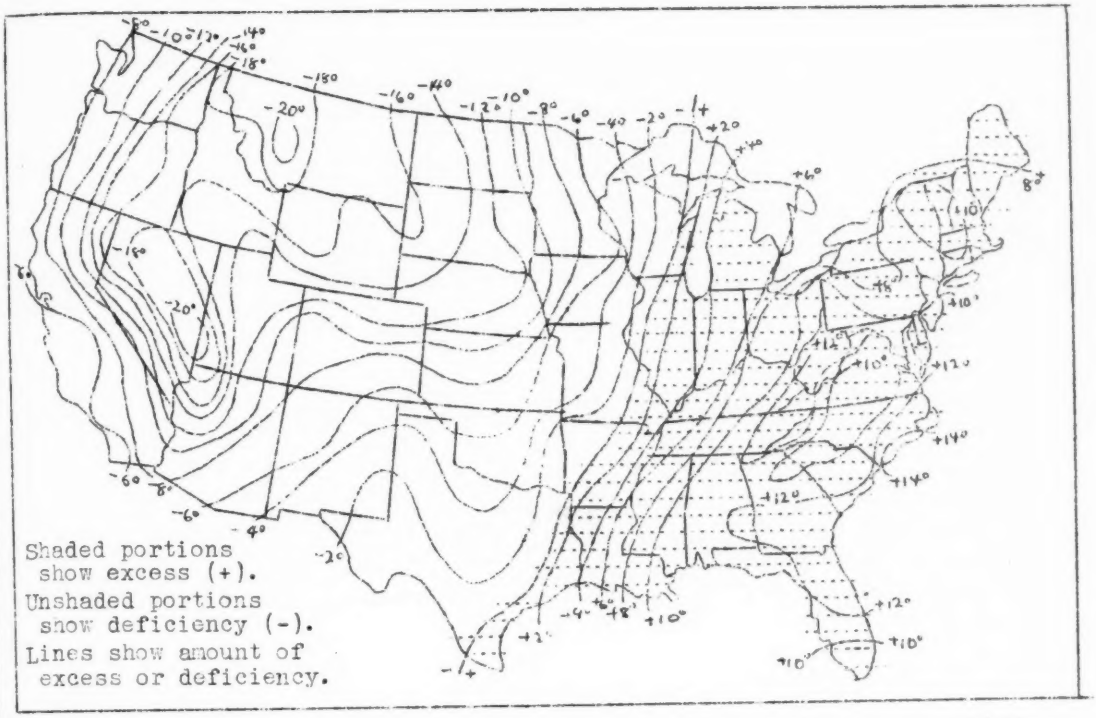

Fig. 7. Departure of Mean Temperature from the Normal for January 1937.

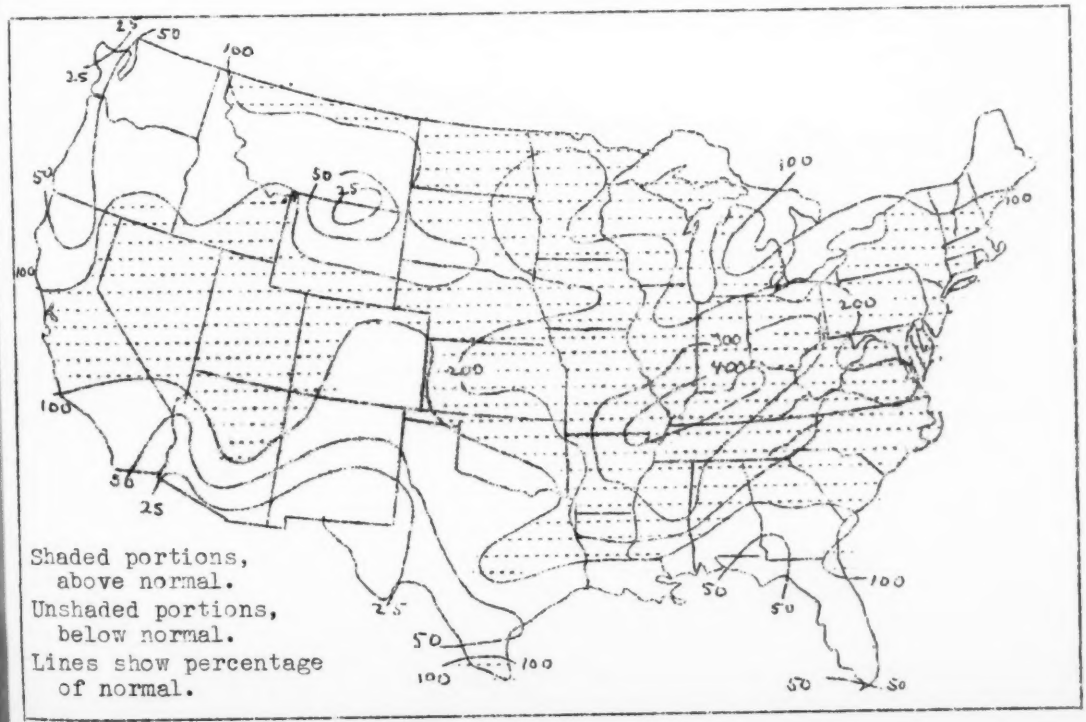

Fig. 8. Percentage of Normal Precipitation for January 1937.

relatively coldest weather occurred in the northern Plains, the northern Rocky Mountains, and the Great Basin of the West.

Figure 8 shows the percentage of normal precipitation for the month. Except in the extreme South, and locally in the Northeast, January was abnormally wet over the entire eastern half of the country, the heavier rains culminating in the Ohio and central Mississippi Valleys, where, over considerable areas, from three to more than four times the normal occurred. These rains resulted in one of the most disastrous floods ever experienced in this country.

In the West relatively heavy precipitation occurred in the Great Basin and in central California, but elsewhere the monthly totals were generally below normal. The far Northwest had a little more than half the normal amount, while the southwestern Plains, from eastern Colorado southward and southeastward, continued dry, with some stations reporting less than one-fourth the normal precipitation. Also, the extreme Southeast had but scanty rainfall.